REMARKS

Claims 1-20 are pending in the present application. Reconsideration of the claims is respectfully requested.

I.   **35 U.S.C. § 103, Alleged Obviousness Based on Bachmat and Auslander**

The Office Action rejects claims 1-20 under 35 U.S.C. § 103(a) as being allegedly unpatentable over Bachmat et al. (U.S. Patent Number 6,122,685) in view of Auslander et al. (U.S. Patent Number 5,129,088). This rejection is respectfully traversed.

With regard to independent claims 1,10, and 19, the Office Action states:

> As to claim 1, Bachmat teaches device information (the file or logical volume/ the format in the BCV device, col 8, ln 17-67), a device (the selected BCV device, col 8, ln 17-67), transforming (convert, col 8, ln 17-67), a logical disk (the original logical volume, col 8, ln 17-67).
> Bachmat does not teach device volume management, a device driver for a device. However, Auslander teaches the logical volume manage (col 9, ln 60-67 to col 10, ln 10-30/ col 13, ln 25-60), device driver (col 14, ln 50-67).
> It would have been obvious to apply the teaching of Auslander to Bachmat in order to provide ability to create, modify and query logical volumes, physical volumes and volume groups...
> As to apparatus of claim 10, see the rejection of claim 1...
> As to computer program product of claim 19, see the rejection of claim 1...

Office Action dated July 8, 2003, pages 2-5.

Claim 1, which is representative of the other rejected independent claims 10 and 19 with regard to similarly recited subject matter, reads as follows:

> 1.   A method for providing device management in a logical volume management system, comprising:
> receiving device information from a device driver for a device; and
> **transforming the device into a logical disk based on the device information. (emphasis added)**

Neither *Bachmat* nor *Auslander*, either alone or in combination, teach or suggest transforming the device into a logical disk based on the device information as recited in independent claims 1, 10, and 19. Furthermore, it would not have been obvious to modify *Bachmat*, *Auslander*, or any alleged combination of these references, to include such a feature.

Bachmat is directed to a method and apparatus for reconfiguring a file or logical volume stored on a magnetic disk storage system for optimal performance. *Bachmat's* method improves the performance of the magnetic disk storage system that stores data in logical volumes by storing a first logical volume of a predetermined size with a first of a plurality of possible formats and operates in response to data transfer requests in a first application. Performance is enhanced by establishing a second logical volume of at least a predetermined size for storing the data. Conditions are monitored to determine a time when a second application will process that data wherein performance of the second application would be enhanced if the data were stored in a second format. When that condition exists, data is copied from the first logical volume to a second logical volume in the second format. Thereafter, data transfer requests generated by the second application are directed to the second logical volume.

Auslander is directed toward data processing methods for use in data processing systems for allocating physical storage space on a secondary storage device and in particular to an improved method, which automatically adjusts the allocated size of a virtual disk dynamically as additional storage space is required by the system. *Auslander* states in the background of the invention that prior to actually assigning a file to disk blocks, a determination is made to divide the available disk storage space of the storage subsystem into a number of different areas and that these assigned areas are often referred to as virtual disks, i.e. partitions of the disk. The term mini-disk is used in the AIX system and the term A-disk in IBM's VM system. *Auslander* teaches a logical volume is created which includes only the minimum number of physical partitions on the disk required to store the file system. As more storage space is needed by the file system, the logical volume manager allocates an additional physical partition to the logical volume. The individual physical partitions of the logical volume may be on different disk drives.

Neither reference teaches or suggests a *logical disk*, let alone transforming a device into a logical disk based on device information obtained from a device driver for the device.

Claim 1 recites transforming the device into a *logical disk* based on the device information. The *"logical disk"* is described the specification on page 4, lines 1-4, as an abstraction created by the device managers and that the Logical Volume Manager is

modified to use only *logical disks*. As described on page 13 of the specification, device managers transform physical devices into *logical disks*. The *logical disks* are partitioned into logical partitions. Volume groups are reconstructed and logical blocks are exported. Finally, *logical volumes* are created from the logical partitions/blocks and exported for use by the operating system. Thus, a *"logical disk"* and a *"logical volume"* are not the same entity.

In addition, the term *"logical disk"* as it is used in independent claims 1, 10, and 19 must be read in light of the specification. Pages 13-14 of the present specification set forth the properties of a *logical disk*. These properties include:

> 1) can be given a user defined name which is stored on the device and persists across reboots, configuration changes, and attaching of the device to a different EVMS;
> 2) can be given a unique EVMS serial number that is stored on the device for identifying the device to EVMS;
> 3) can store the EVMS serial number of the logical drive that the system boots from;
> 4) can store its assigned geometry; and
> 5) can store data such that data stored to a specific location on the *logical disk* can later be read from that location on the *logical disk*.

Neither the *"logical volumes"* of *Bachmat* nor the *"logical volumes"* or *"virtual disks"* of *Auslander* have such properties. Thus, both a *"logical volume"* and a *"virtual disk"* are different from a *"logical disk"*, as recited in claims 1, 10, and 19.

In the rejection of independent claims 1, 10, and 19, the Office Action refers to the following portion of *Bachmat* as allegedly teaching a *logical disk*:

> Before the procedure of FIG. 4A begins, the corresponding logical volume, file, block or storage element containing data is located in one or more of the logical volumes 112 through 114 for processing by the APP A application program associated with the host 101. The format for that block may be a log structured format, a conventional non-stripped format or any other format. Once this procedure in FIG. 4A has been completed, further actions by the APP B application program in host 102 will involve the selected one of the BCV devices 115 through 117. It may also involve all the BCV devices if the alternate format for the APP B program is a stripped format. At this time, the logical volume in its original format can remain in its original logical volume. Thereafter the APP B application, shown with the host 102, operates with data in the alternate format, such as a stripped or non-stripped format, for the remainder of the interval.
> Completion of any interval may be identified by an event sensed by the event monitor module 51 or an event that bears some time reference to the

beginning of the interval. For example, if the system administrator determines the starting time for processing in the cache, the system administrator may also identify the time at which that processing completes. When the event occurs, decision block 120 in FIG. 4A recognizes the termination of the interval and transfers control to step 140 in FIG. 4B. If the event is not a start or end event, step 140 diverts to step 141 to generate an error message and terminate operation. When an end event occurs, step 140 directs to a procedure by which the transfer control module 50 transfers the file or logical volume from the selected BCV device to the original logical volume in its original format in a manner that is analogous to the transfer of FIG. 4A.

More specifically, step 141 retrieves the characteristics from the table 54 including the format of the file in its original location. Step 142 generates the arguments for controlling the copy module 107; step 143, the arguments for the reformat module 108. As will be apparent at the end of steps 142 and 143, the copy module will use the selected BCV device as the source and the original storage volume as the destination and the reformat module will be set to convert the format in the BCV device back to the original format in the original logical volume.

Once these arguments are generated, step 144 enables the copy module 107 and reformat module 108 in FIG. 3 to transfer the data in the altered format in the selected BCV device to the original volume in the original format, again in a matter of minutes. Next, in step 145 the contents of the control block, such as the control block 38, in FIG. 1 are altered so that all requests for the data set are routed to the original logical volume.

Bachmat, column 8, lines 17-67.

This portion of *Bachmat* describes reformatting the current or original format of a *logical volume* into an alternate format and returning the *logical volume* to its original format. This portion of *Bachmat* has nothing to do with transforming a device into a *logical disk* based on the device information as recited in claims 1, 10, and 19. Further, *Bachmat* teaches reformatting a *logical volume* rather than transforming a physical device into a *logical disk* as recited in claims 1, 10, and 19. Additionally, a *logical volume* is not a *logical disk*, as discussed above. Thus, *Bachmat* does not teach or suggest the feature of transforming the device into a *logical disk* based on the device information as recited in claims 1, 10, and 19.

Additionally, *Auslander* does not teach or suggest the feature of transforming the device into a *logical disk* based on the device information as recited in independent claims 1, 10, and 19. The portions of *Auslander* referred to by the Office Action in the rejection of claims 1, 10, and 19 describe the functionality of a Logical Volume Manager.

Auslander states that the Logical Volume Manager provides the ability to create, modify and query *logical volumes*, physical volumes, and volume groups. The Logical Volume Manager of *Auslander* does not transform a device into a *logical disk* based on device information as recited in claims 1, 10, and 19. As set forth above, a *logical disk* is an additional layer of abstraction in the mechanism of the present invention. Once a device is transformed into a *logical disk*, the *logical disk* may be transformed into logical partitions and then *logical volumes* can then be created from the logical partitions. A *logical disk* has properties that the *logical volumes* and *virtual disks* of *Auslander* do not have, as discussed above. Thus, *Auslander* does not teach or suggest the feature of transforming the device into a *logical disk* based on the device information as recited in claims 1, 10, and 19.

Therefore, since neither *Bachmat* nor *Auslander* teach or suggest the feature of transforming the device into a *logical disk* based on the device information as recited in independent claims 1, 10, and 19, Applicants respectfully submit that any alleged combination of *Bachmat* and *Auslander* still would not teach or suggest the features of independent claims 1, 10, and 19. Furthermore, it would not be obvious to modify *Bachmat*, *Auslander*, or the alleged combination to include transforming a device into a *logical disk* based on the device information because neither reference recognizes a need for an additional abstraction such as a *logical disk*, having the properties of such a *logical disk*. One of ordinary skill in the art presented only with the references, would not conclude to combine them and modify them in the particular way necessary to include transforming a device into a *logical disk* based on the device information.

Since claims 2-9, 11-18, and 20 depend from independent claims 1, 10, and 19, the same distinctions between the combination of *Bachmat* and *Auslander* apply to dependent claims 2-9, 11-18, and 20. Thus, the combination of *Bachmat* and *Auslander* does not teach or suggest the features of dependent claims 2-9, 11-18, and 20 at least by virtue of their dependency.

Additionally, neither *Bachmat* nor *Auslander*, either alone or in combination, teach or suggest the specific features of dependent claims 2-9, 11-18, and 20. For example, with regard to claims 2, 11, and 20, *Bachmat* does not teach or suggest a device being transformed into a *logical disk* by a device manager plug-in module. The Office

Action alleges that this feature is taught by the portion of *Bachmat* discussed above and the following portion of *Bachmat*:

> In this particular embodiment, this invention can be realized by adding other modules to the system manager 45. A transfer control module 50, as described later, controls all processing required by this invention. The transfer control module 50 receives information from an event monitor module 51, available disk cache module 52 and available file format module 53. A configuration table 54 contains information concerning file identification, format, file size and location within the physical volumes 41 and 43.

Bachmat, column 5, lines 33-41.

In these sections, *Bachmat* teaches that modules are added to the system manager 45 to reconfigure a *logical volume* of data into an alternate format using available disk cache and returning the *logical volume* into its original format. There is no teaching or suggestion regarding a device being transformed into a *logical disk* by a device manager plug-in module as recited in claim 2, 11, and 20. As discussed previously, a *logical volume* is not a *logical disk* and *Bachmat* teaches reconfiguring a *logical volume* rather than transforming a device into a *logical disk*. Thus, despite the allegations to the contrary, *Bachmat* actually does not teach or suggest the features of claims 2, 11, and 20.

As a further example, neither *Bachmat* nor *Auslander*, either alone or in combination, teach or suggest the feature of transforming the logical disk into a logical partition, as recited in claims 3 and 12. The Office Action alleges that this feature is taught by *Auslander* at column 15, lines 52-68, which read:

> To map a logical address to a physical address, the logical volume device driver running at the driving site: (1) indexes into the logical volume map by logical volume number, (2) finds the first entry in the logical partition map corresponding to the first logical partition contained within the logical volume, then (3) looks up the physical volume and physical partition corresponding to the correct copy of the logical partition.
> The data structure described in FIG. 10 contains space for allocating additional logical volumes, and for allocating additional logical partitions to logical volumes. For example, entry 2 in the logical partition array has not been used, and may be used to allocated a third logical partition to logical volume 0.
> A device driver handling a physical request must map the physical address contained within the request into a device address before it can act on the request.

This portion of *Auslander* is directed to logical volumes, not logical disks as previously discussed. *Auslander* does not teach or suggest the extra layer of abstraction

associated with transforming a physical device into a *logical disk*. *Auslander* teaches that a physical volume and physical partition corresponding to the correct copy of the logical partition is the location to look up a physical address. The present invention describes an additional layer referred to as a *logical disk*. *Auslander* does not teach or suggest this additional layer of a *logical disk* between a physical device and a logical partition. Therefore, *Auslander* does not teach or suggest transforming the *logical disk* into a logical partition. Thus, neither *Bachmat* nor *Auslander*, either alone or combined, teach or suggest the features as recited in claims 3 and 12.

Therefore, Applicants respectfully submit that neither *Bachmat*, *Auslander*, nor the combination of *Bachmat* and *Auslander*, teach or suggest the features as recited in dependent claims 2-9, 11-18, and 20. In view of the above, Applicants respectfully request withdrawal of the rejection of claims 1-20 under 35 U.S.C. § 103(a).
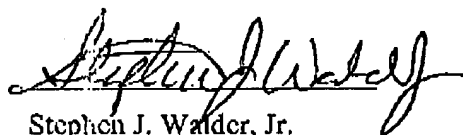
II.   Conclusion

It is respectfully urged that the subject application is patentable over *Bachmat* in view of *Auslander* and is now in condition for allowance. The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

Respectfully submitted,

DATE: *October 8, 2003*

Stephen J. Walder, Jr.
Reg. No. 41,534
Carstens, Yee & Cahoon, LLP
P.O. Box 802334
Dallas, TX 75380
(972) 367-2001
Attorney for Applicants

RECEIVED
CENTRAL FAX CENTER

OCT 0 9 2003

OFFICIAL

SJW/vja